

2. THE PRINCIPLES OF DARWINISM

THERE is no need in our times and particularly in this country, to explain in a full manner the theory known under the name of Darwinism. All of you know this theory, at least in its outlines, and so we may enter at once upon its analytic discussion. A few words only I beg you to allow me as to the name of "Darwinism" itself. Strange to say, Darwinism, and the opinion of Charles Darwin about the descent of organisms, are two different things. Darwin, the very type of a man devoted to science alone and not to personal interests,—Darwin was anything but dogmatic, and yet Darwinism is dogmatism in one of its purest forms. Darwin, for instance, gave the greatest latitude to the nature of the variations which form the battleground of the struggle for existence and natural selection; and he made great allowances for other causal combinations also, which may come into account besides the indirect factors of transformism. He was Lamarckian to a very far-reaching extent. And he had no definite opinion about the origin and the most intimate nature of life in general. These may seem to be defects but really are advantages of his theory. He left open the question which he could not answer, and, in fact, he may be said to be a good illustration of what Lessing says, that it is

not the possession of truth but the searching after it, that gives happiness to man. It was but an outcome of this mental condition that Darwin's polemics never left the path of true scientific discussions, that he never in all his life abused any one who found reason to combat his hypotheses, and that he never turned a logical problem into a question of morality.

How different is this from what many of Darwin's followers have made out of his doctrines, especially in Germany; how far is "Darwinism" removed from Darwin's own teaching and character!

It is to Darwinism of the *dogmatic* kind, however, that our next discussions are to relate, for, thanks to its dogmatism, it has the advantage of allowing the very sharp formulation of a few causal factors, which *a priori* might be thought to be concerned in organic transformism, though we are bound to say that a really searching analysis of these factors ought to have led to their rejection from the very beginning.

The logical structure of dogmatic Darwinism reveals two different parts, which have nothing at all to do with one another.

NATURAL SELECTION

We shall first study that part of it which is known under the title of natural selection, irrespective of the nature of the causes of primary differences, or, in other words, the nature of variability. This part may be said to belong to Darwin's personal teachings and not only to "Darwinism." The offspring of a certain number of adults show differences compared with each other; there are more

individuals in the offspring than can grow up under the given conditions, therefore there will be a struggle for existence amongst them which only the fittest will survive; these survivors may be said to have been "selected" by natural means.

It must be certain from the very beginning of analysis that natural selection, as defined here, can only eliminate what cannot survive, what cannot stand the environment in the broadest sense, but that natural selection never is able to create diversities. It always acts negatively only, never positively. And therefore it can "explain"—if you will allow me to make use of this ambiguous word—it can "explain" only why certain types of organic specifications, imaginable *a priori*, do *not* actually exist, but it never explains at all the existence of the specifications of animal and vegetable forms that are actually found. In speaking of an "explanation" of the origin of the living specific forms by natural selection one therefore confuses the sufficient reason for the non-existence of what there is not, with the sufficient reason for the existence of what there is. To say that a man has explained some organic character by natural selection is, in the words of Nägeli, the same as if some one who is asked the question, "Why is this tree covered with these leaves," were to answer "Because the gardener did not cut them away." Of course that would explain why there are no more leaves than those actually there, but it never would account for the existence and nature of the existing leaves as such. Or do we understand in the least why there are white bears in the Polar Regions if we are told that bears of other colours could not survive?

In denying any real explanatory value to the concept

of natural selection I am far from denying the action of natural selection. On the contrary, natural selection, to some degree, is *self-evident*; at least as far as it simply states that what is incompatible with permanent existence cannot exist permanently, it being granted that the originating of organic individuals is not in itself a guarantee of permanency. Chemical compounds, indeed, which decompose very rapidly under the conditions existing at the time when they originated may also be said to have been eliminated by "natural selection." It is another question, of course, whether in fact all eliminations among organic diversities are exclusively due to the action of natural selection in the proper Darwinian sense. It has been pointed out already by several critics of Darwinism and most clearly by Gustav Wolff, that there are many cases in which an advantage with regard to situation will greatly outweigh any advantage in organisation or physiology. In a railway accident, for instance, the passengers that survive are not those who have the strongest bones, but those who occupied the best seats; and the eliminating effect of epidemics is determined at least as much by localities, *e.g.* special houses or special streets, as by the degree of immunity. But, certainly, natural selection is a *causa vera* in many other cases.

We now may sum up our discussion of the first half of Darwinism. Natural selection is a negative, an eliminating factor in transformism; its action is self-evident to a very large degree, for it simply states that things do not exist if their continuance under the given conditions is impossible. To consider natural selection as a positive factor in descent would be to confound the sufficient reason

for the non-existence of what is not, with the sufficient reason of what is.

Natural selection has a certain important logical bearing on systematics, as a science of the future, which has scarcely ever been alluded to. Systematics of course has to deal with the totality of the possible, not only of the actual diversities; it therefore must remember that more forms may be possible than are actual, the word "possible" having reference in this connection to originating, not to surviving. Moreover, systematics is concerned not only with what has been eliminated by selection, but also with all that might have originated from the eliminated types. By such reasoning natural selection gains a very important aspect—but a logical aspect only.

FLUCTUATING VARIATION THE ALLEGED CAUSE OF ORGANIC DIVERSITY

The second doctrine of dogmatic Darwinism states that all the given diversities among the organisms that natural selection has to work upon are offered to natural selection by so-called fluctuating variation; that is, by variation as studied by means of statistics. This sort of variation, indeed, is maintained to be indefinite in direction and amount, at least by the most conservative Darwinians; it has occasionally been called a real differential; in any case it is looked upon as being throughout contingent with regard to some unity or totality; which, of course, is not to mean that it has not had a sufficient reason for occurring.

It could hardly be said to be beyond the realm of possibility that such differences among organic species as

only relate to degree or quantity and perhaps to numerical conditions also, might have been "selected" out of given contingent variations, if but one postulate could be regarded as fulfilled. This postulate may appropriately be stated as the fixation of new averages of variation by inheritance. Let the average value of a variation, with regard to a given property of a given species be n and let the value $n + m - m$ being variable—which is represented in fewer individuals of course than is n , be such as to offer advantages in the struggle for existence; then the individuals marked by $n + m$ will have the greater chance of surviving. Our postulate now states that, in order that a permanent increase of the average value of the variation in question may be reached, $n + m$ in any of its variable forms must be able to become the average value of the second generation, as n was the average value of the first. Out of the second generation again it would be the few individuals marked by $n + m + o$, which would be selected; $n + m + o$ would be the new average; afterwards $n + m + o + p$ would be selected, would become the new average, and so on. A black variety for instance might be selected by such a series of processes out of a grey-coloured one without difficulty.

But our postulate is not beyond all doubt: certain experiments, at least, which have been carried out about the summation of variations of the true fluctuating type by any kind of selection seem to show that there may be a real progress for a few generations, but that this progress is always followed by a reversion. Of course our experience is by no means complete on this subject, and, indeed, it may be shown in the future that positive

transforming effects of fluctuating variability, in connection with selective principles, are possible in the case of new quantitative differences (in the widest sense), but we are not entitled to say so at present.

And this is the only condition on which we can give credit to the second doctrine of dogmatic Darwinism. Its second principle, indeed, proves to be absolutely inadequate to explain the origin of any other kind of specific properties whatever.

I cannot enter here into the whole subject of Darwinian criticism.¹ Our aims are of a positive character, they desiderate construction and only use destruction where it is not to be avoided. So I shall only mention that dogmatic Darwinism has been found to be unable to explain every kind of mutual adaptations, *e.g.* those existing between plants and insects; that it can never account for the origin of those properties that are indifferent to the life of their bearer, being mere features of organisation as an arrangement of parts; that it fails in the face of all portions of organisation which are composed of many different parts—like the eye—and nevertheless are functional units in any passive or active way; and that, last not least, it has been found to be quite inadequate to explain the first origin of all newly formed constituents of organisation even if they are not indifferent: for how could any rudiment of an organ, which is not functioning at all, not only be useful to its bearer, but be useful in such a degree as to decide about life or death?

¹ See Wigand, *Der Darwinismus und die Naturforschung Newton's und Cuvier's*, Braunschweig, 1874-7; Nägeli, *Mechanisch-physiologische Theorie der Abstammungslehre*, München, 1884; G. Wolff, *Beiträge zur Kritik der Darwin'schen Lehre*, 2nd ed. Leipzig, 1898; etc.

It is only for one special feature that I should like to show, by a more full analysis, that dogmatic Darwinism does not satisfy the requirements of the case. The special strength of Darwinism is said to lie in its explaining everything that is useful in and for organisms; the competitive factor it introduces does indeed seem to secure at least a relative sort of adaptedness between the organism and its needs. But in spite of that, we shall now see that Darwinism fails absolutely to explain those most intimate organic phenomena which may be said to be the most useful of all.

Darwinism in its dogmatic form is not able to explain the origin of any sort of organic restitution; it is altogether impossible to account for the restitutive power of organisms by the simple means of fluctuating variation and natural selection in the struggle for existence. Here we have the logical *experimentum crucis* of Darwinism.

Let us try to study in the Darwinian style the origin of the regenerative faculty, as shown in the restitution of the leg of a newt. All individuals of a given species of the newt, say *Triton taeniatus*, are endowed with this faculty; all of them therefore must have originated from ancestors which acquired it at some time or other. But this necessary supposition implies that all of these ancestors must have lost their legs in some way, and not only one, but all four of them, as they could not have acquired the restitutive faculty otherwise. We are thus met at the very beginning of our argument by what must be called a real absurdity, which is hardly lessened by the assumption that regeneration was acquired not by all four legs together, but by one after the other. But it is absolutely inevit-

able to assume that *all* the ancestors of our *Triton* must have lost one leg, or more correctly, that only those of them survived which had lost one! Otherwise not all newts at the present day could possess the faculty of regeneration! But a second absurdity follows the first one; out of the ancestors of our newt, which survived the others by reason of having lost one of their legs, there were selected only those which showed at least a very small amount of healing of their wound. It must be granted that such a step in the process of selection, taken by itself, would not at all seem to be impossible; since healing of wounds protects the animals against infection. But the process continues. In every succeeding stage of it there must have survived only those individuals which formed just a little more of granulative tissue than did the rest: though *neither* they themselves *nor* the rest could use the leg, which indeed was not present! That is the second absurdity we meet in our attempt at a Darwinian explanation of the faculty of regeneration; but I believe the first one alone was sufficient.

If we were to study the "selection" of the faculty of one of the isolated blastomeres of the egg of the sea-urchin to form a whole larva only of smaller size, the absurdities would increase. At the very beginning we should encounter the absurdity, that of all the individuals there survived only those which were not whole but half; for *all* sea-urchins are capable of the ontogenetical restitution in question, *all* of their ancestors therefore must have acquired it, and they could do that only *if* they became halved at first by some accident during early embryology. But we shall not insist any further on this instance, for it would

not be fair to turn into ridicule a theory which bears the name of a man who is not at all responsible for its dogmatic form. Indeed, we are speaking against Darwinism of the most dogmatic form only, not against Darwin himself. He never analysed the phenomena of regeneration or of embryonic restitution—they lay in a field very unfamiliar to him and to his time. I venture to say that if he had taken them into consideration, he would have agreed with us in stating that his theory was not at all able to cover them; for he was prepared to make great concessions, to Lamarckism for instance, in other branches of biology, and he did not pretend to know what life itself is.

Darwin was not a decided materialist, though materialism has made great capital out of his doctrines, especially in Germany. His book, as is well known, is entitled “The Origin of *Species*,” that is of organic *diversities*, and he himself possibly might have regarded all restitution as belonging to the original properties of life, anterior to the originating of diversities. Personally he might possibly be called even a vitalist. Thus dogmatic “Darwinism” in fact is driven into all the absurdities mentioned above, whilst the “doctrine of Darwin” can only be said to be wrong on account of its failing to explain mutual adaptation, the origin of new organs, and some other features in organic diversities; the original properties of life were left unexplained by it intentionally.

DARWINISM FAILS ALL ALONG THE LINE

The result of our discussion then must be this: selection has proved to be a negative factor only, and fluctuating

variation as the only way in which new properties of the organisms might have arisen has proved to fail in the most marked manner, except perhaps for a few merely quantitative instances. Such a result betokens the complete collapse of dogmatic Darwinism as a general theory of descent: the most typical features of all organisms remain as unexplained as ever.

What then shall we put in the place of pure Darwinism? Let us first try a method of explanation which was also adopted occasionally by Darwin himself: let us study that form of transformation theories which is commonly known under the title of Lamarckism.